

## REMARKS

Claims 1-28 and 29-35 are pending.

Claims 15, 20, 24, 28, 32, and 35 are presently amended.

Claims 15, 17, 19-28, and 32-35, are rejected.

Claims 1-14 and 29-31 are withdrawn.

Claims 16 and 18 were cancelled without prejudice, in the Amendment and Response of July 15, 2010.

Applicants believe that no new matter is added by way of this amendment.

A. Applicable case law on anticipation

i. The reference must teach every element of the claim

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference."

*Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

ii. The disclosure in an anticipating reference must provide an enabling disclosure

According to the Manual of Patent Examining Procedure (MPEP §2121.01), "[i]n determining that quantum of prior art disclosure which is necessary to declare an applicant's invention 'not novel' or 'anticipated' within section 102, the stated test is whether a reference contains an 'enabling disclosure' . . ." *In re Hoeksema*, 399 F.2d

269, 158 USPQ 596 (CCPA 1968). The disclosure in an assertedly anticipating reference must provide an enabling disclosure of the desired subject matter . . ."<sup>1</sup>

**B. Applicable case law on obviousness**

i. **Graham criteria**

The factual inquiry under *Graham v. John Deere*, 383 U.S. 1, 148 USPQ 459 (1966), includes the following:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.

ii. **Requirement for articulated reasoning**

The case law of obviousness requires that a rejection under 35 U.S.C. §103 cannot be based on mere conclusory statements, but there must be some articulated reasoning to support the conclusion of obviousness. According to the MPEP, "[t]he key to supporting any rejection under 35 U.S.C. §103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. The Supreme Court in *KSR* noted that the analysis supporting a rejection under 35 U.S.C. §103 should be made explicit. The Court quoting *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006), stated that . . . there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness."<sup>2</sup>

**C. Amendments to the claims**

Claim 15 is amended to include language, e.g., "predetermined sequential manner." A basis for this amendment is in paragraph 0016 of the specification.

Claims 20, 24, 28, and 35, are amended to correct simple typos.

Claim 32 is amended to include language, e.g., "predetermined sequential manner." A basis for this amendment is in paragraph 0016 of the specification.

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<sup>1</sup> Manual of Patent Examining Procedure, 2121.01. Rev. 6, Sept. 2007, page 2100-55.

<sup>2</sup> Manual of Patent Examining Procedure (MPEP) §2141 III, page 2100-119, rev. 6, Sept. 2007.

D. **Claim rejections under 35 USC §102(b) (anticipation)**

The Examiner rejected Claims 15, 17, 24-28, and 32-33, under 35 USC §102(b), in view of Wieland (U.S. Pat. No. 7,150,866).

i. **Claims 25 and 32**

The following responds to the rejections of independent Claims 25 and 32.

The Examiner contends that Wieland discloses the following elements:

- (a) A single hydrogen reactor chamber;
- (b) A plurality of steam reformation catalysts in the single hydrogen reactor chamber, to form a staged configuration;
- (c) The staged configuration comprising a series of distinct zones or portions;
- (d) Each zone is in physical contact with at least one other zone, and each zone contains at least one steam reformation catalyst;
- (e) Where the plurality of steam reformation catalysts includes a high-activity steam reformation catalyst, a coke-resistant steam reformation catalyst, and a steam reformation catalyst that promotes a water-gas shift reaction.

Applicants respectfully submits that Wieland fails to disclose, "a series of distinct zones or portions."

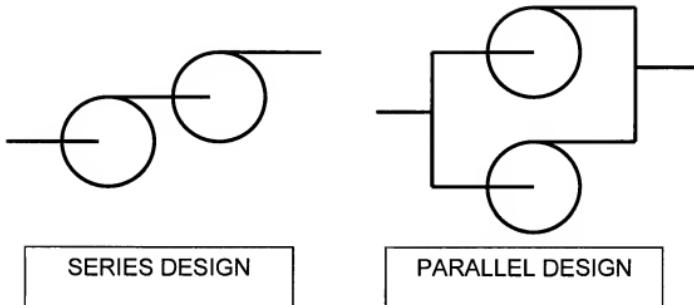
It is axiomatic that a skilled artisan will recognize the term "series" necessarily requires "sequence", i.e., in a passage from an inlet to an outlet, the first zone must be traversed, and that following traversal of the first zone, the second zone must be traversed, and so on. According to the *Dictionary of Engineering Terms*,<sup>3</sup> a series is, "[a] method of connecting the elements of an electrical circuit . . . so that current flow is common to all the elements of the circuit . . . [i]f one circuit element fails, the circuit is broken and the current flow ceases in all the circuit elements." Applicants submit that this particular definition of "series," while it resides in the context of electric circuits,

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<sup>3</sup> Timings, R.L., and Twigg, P. (2001) *The Pocket Illustrated Dictionary of Engineering Terms*, Butterworth Heinemann, Oxford, UK, page 265.

"series" has the same meaning, as understood by the skilled artisan in the chemical engineering arts. Page 495 of *Engineering Fluid Mechanics*, 9<sup>th</sup> edition, by C.T. Crowe, et al, discloses a first diagram of two pumps that are connected in series, and a second diagram showing two pumps connected in parallel.

For the Examiner's convenience, the drawings of a sequential design (two pumps) and parallel design (two pumps), in chemical engineering, are reproduced below. These drawings are reproduced from figure 14.17 (page 495) of *Engineering Fluid Mechanics*. The sequential nature (components in series) of the present invention is shown in Figure 2, where the sequential or series aspect of the disclosure as set forth in the amended claims is delineated by the numbers, (200), (202), and (204) (and Fig. 2 of Applicant's specification).



Wieland does not disclose a series design. Wieland fails to disclose flow of gas in a serially or "predetermined sequential manner." Accordingly, Wieland is not a proper Section 102 reference to the amended claims. Upon reading para. 0076, and in contemplating Fig. 2, the skilled artisan will understand Claims 15 and 32, and claims depending from Claims 15 and 32, to require a "predetermined sequential nature." And the skilled artisan will understand the non-limiting example of para. 0076 and Fig. 2 to militate that the gas first encounters zone (204), next, the gas encounters zone (202), and finally the gas encounters zone (200). The claims have been amended to provide greater clarity on this point.

Wieland at col. 3, lines 53-55, reinforces that it is non serial methodology. "a feed mixture of hydrocarbons, oxygen and water or water vapour . . . is passed over the catalyst . . ." (emphasis added). This does not constitute a disclosure that of gasses passing through the catalysts in series. And it does not constitute a disclosure of "wherein a feed stream passed in a reactor chamber is exposed to the plurality of catalysts in a predetermined sequential manner," as is required in amended Claims 15 and 32.

Applicant respectfully submits that in view of the Applicant's disclosure this sequential serial flow would have been understood from the claims. An amendment has been provided to underscore this limitation with greater clarity.

Wieland also fails to provide an enabling disclosure for the purpose it is being applied . Conspicuously absent from Wieland is any disclosure of a device or system that has a sequential flow of gasses through staged catalysts. Wieland merely describes that "a feed mixture of hydrocarbons, oxygen and water or water vapor . . . is passed over a multilayer catalyst . . ." (col. 1, lines 8-11, Wieland). This does not constitute a description of gasses passing through the catalysts in series . All that is disclosed is that the "feed mixture" is "passed over a multilayer catalyst." In fact, the language of Wieland ("passes over") could reasonably be interpreted as suggesting that the "feed mixture" never touches the multilayer catalyst.

Moreover, according to *In re Hoeksema*, as quoted in the MPEP §2121.01, and as cited above, "[i]n determining that quantum of prior art disclosure which is necessary to declare an applicant's invention 'not novel' or 'anticipated' within section 102, the stated test is whether a reference contains an 'enabling disclosure.'" Wieland does not contain an enabling disclosure for the limitations that it is being applied for. Wieland discloses layers of catalysts in contact with a support body in Figures 1 and 2 Wieland describes that "a feed mixture of hydrocarbons, oxygen and water or water vapor . . . is passed over the catalyst." (col. 3, lines 53-56, Wieland). However, Wieland fails to teach, either explicitly or inherently, that the feed mixture actually contacts each and every one of the catalyst layers nor does it teach sequential contact with layers. Wieland fails to teach, either explicitly or inherently, that the feed mixture necessarily contacts each and every one of the catalyst layers.

Wieland also fails to disclose the location of any inlet or outlet for gasses nor does it necessitate the exposure of the gasses to all of the catalyst layers in a predetermined sequence. In view of the silence of the Wieland disclosure, it is improperly applied as a

anticipatory reference to the instant application. Applicants respectfully submit that the Wieland reference is overcome as non-enabled, under *In re Hoeksema*. Accordingly, for this reason also withdrawal of the anticipation is earnestly requested.

ii. **Claim 17**

The following responds to the rejection of dependent Claim 17 (page 3, lines 9-11, of Office Action). The Examiner alleges that Wieland teaches wherein the coke-resistant steam reformation catalyst (3) is loaded at an entrance of said hydrogen reactor chamber." However, the contrary is true - Wieland fails expressly to disclose an entrance, fails to disclose an exit, fails to disclose an inlet, and fails to disclose an outlet, of any hydrogen reactor chamber.

A word search of Wieland reveals the terms "inlet surface" and "outlet surface," however, these terms have no context that is relevant to the present rejection – there is no disclosure in the written specification nor the Figures that line up those terms with any identifiable structural element. As such these terms are ambiguous. A skilled artisan would not understand an "inlet surface" to be the same thing as an "inlet." Wieland is vague, unclear and silent on any structural relationship between an inlet or outlet, and any catalyst . The conclusion that Wieland is ambiguous and lacks antecedent basis is further compelled by the fact that the terms "inlet surface" and "outlet surface" reside only in the claims, and arguably have no basis in Wieland's specification.

Withdrawal of this rejection is solicited in earnest.

iii. **Claim 24**

The Examiner alleges that Wieland discloses that said coke-resistant steam reformation catalyst is loaded at an entrance of said steam reformer, followed by said high-activity steam reformation catalyst. For two reasons, Applicants respectfully disagree. First, as

previously noted Wieland fails to disclose any entrance or inlet for a steam reformer. Second, Wieland fails to disclose that gas is first exposed to a first catalyst, where this exposure is necessarily followed by exposure of the gas to a second catalyst. Applicants submit that in view of the clarifications provided by the amendments the basis for this rejection has been removed. Allowance of this claim is solicited in earnest.

E. **Claim rejections under 35 USC §102(e) (anticipation)**

The Examiner rejected Claims 15, 17, 19-20, 24-28, and 32-33, under 35 USC §102(e), in view of Wieland (US 2004/0063577) (page 4, line 3-20 to page 5, lines 1-12, of Office Action. In imposing this anticipation rejection, the Examiner referred to her rationale in using the 7,150,866 reference, in the above-identified rejections of Claims 15 and 20.

Applicants respectfully disagree, and refer the Examiner to the above arguments against these claims under 35 USC §102(b). As was found in the above analysis of Wieland's **US 7,150,866**, the following separate review of Wieland's **2004/0063577** reveals that 2004/0063577 is silent on certain elements in the instant claims, or that 2004/0063577 teaches away from the instant claims.

Applicants submit that **2004/0063577** discloses that gasses are passed "over" the multicatalyst layer (Abstract, paras. 0027, 0028, 0051, 0054, of Wieland). As discussed above, this disclosure of "over" fails to anticipate the amended claims., Claims 15 and 24 require that zones of catalysts occur in "series," and also require that the feed stream passes through the zones "in a predetermined sequential manner."

The Examiner's burden in imposing a rejection for anticipation requires a showing that all of the elements in the claim are disclosed in Wieland. Applicants believe that said burden has not been met . Withdrawal of this rejection of independent claims 24 and 35, and of the depending claims, is hereby earnestly solicited.

Applicants acknowledge that **2004/0063577** contains the words “inlet” and “outlet” (paras. 0008, 0043, 0052, of Wieland). However, as discussed above the mere recitation of these words, without any further relevant context, fails to provide any suggestion or guidance as to the relative orientations of the inlet, and direction of gas flow with respect to the order of catalysts or order of zones. These failures of **2004/0063577** compel the conclusion that **2004/0063577** does not disclose all of the elements in Applicants’ independent claims. Moreover, these failures are such that **2004/0063577** can reasonably be characterized as a non-enabling disclosure, and hence improper as a citable publication under 35 USC §102.

F. **Claim rejections under 35 USC §103 (obviousness)**

i. **Obviousness rejection over Wieland**

The Examiner rejected Claims 21-23 under 35 USC §103 as obvious over Wieland (U.S. Pat. No. 7,150,866) (page 5, lines 21-23, of Office Action). In imposing this obviousness rejection, the Examiner referred to her rationale in using the 7,150,866 reference, in the above-identified rejections of Claims 15 and 20.

Applicant contend that this rejection fails to satisfy the *Graham* inquiry. This rejection fails under the *Graham* inquiry because, as explained above, because the cited reference fails to disclose all of the elements in the rejected claims. Moreover, this obvious also fails as a rejection, as the Examiner has not set forth a rationale, as is required under *In re Kahn*. A common rationale that is used in the examining process, for example, is “motivation to combine with a reasonable expectation of success.” However, the Examiner has not set forth any rationale. As such, the grounds for the obviousness rejection have been removed. Withdrawal of the rejection is respectfully requested.

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ii. **Obviousness rejection over Wieland in view of Hwang**

The Examiner rejected Claims 34-35 as obvious under Wieland (2004/0063577) in view of Hwang (U.S. Pat. No. 6,436,363) (page 6, lines 9-21, to page 7, lines 1-2) of Office Action). In a separate, but essentially identical rejection, the Examiner rejected these claims over Wieland (US 2004/0063577), as applied to claim 32, and further in view of Hwang (U.S. Pat. No. 6,436,363) (page 7, lines 3-17, of Office Action). In particular, the Examiner cites Hwang for its disclosure of a "graded catalyst."

Applicants respectfully disagree. As explained above, Wieland fails as a reference under the *Graham* inquiry, because Wieland fails to disclose all of the elements in independent Claims 15 and 32, and hence also fails to disclose all of the elements in the claims which depend from Claims 15 and 32.

Moreover, the obviousness rejections fail under *In re Kahn*, for failing to articulate a proper rationale.

Furthermore, Applicants submit that Wieland (U.S. Pat. No. 7,150,866 and US 2004/0063577) can reasonably be characterized as non-enabled, and hence unsuitable for a rejection under 35 USC §102 or 35 USC §103. Hwang fails to cure the deficiencies of Wieland, because of the following.

Figures 1, 2, and 3, of Hwang disclose a fuel reformer where there is an inlet stream and layers of catalysts. However, these figures show that the flow of the inlet stream goes in parallel (not in series) to the layers of catalysts. These figures do not disclose a series of catalyst layers, that is, where the stream is compelled to pass through the first layer before it reaches the second layer, and where all of the catalyst layers must be traversed before the gas reaches the outlet and passes through the outlet.

In fact, the arrows in these figures point horizontally to the right, implying a configuration consistent with the passage of gas (from the inlet all the way to the outlet) where gas molecules might contact the outside surface of the first layer, but fail to contact the

second layer. Hwang states that the gas stream flows through a "channel (13)" (Col. 7, line 8). Hwang writes, "Layered catalyst member 10 comprises monolith substrate 12 containing channel 13 through which the inlet stream . . . flows." (Col. 7, lines 7-11). In other words, it is not the case that Hwang states that the stream necessarily flows through any catalyst layer in order to reach the outlet, and it is not the case that Hwang states that the stream necessarily flows through more than one layer in order to reach the outlet – instead Hwang states that the stream flows through a "channel."

In fact, Hwang's specification expressly states that the Hwang device can allow passage of the gas through the Hwang layered catalyst reformer, where the gas contacts the first layer, but totally fails to contact the second layer. The writing is as follows:

"In the first step of the process of the present invention, . . . [t]he autothermal reactor contains the layered catalyst member . . . (Col. 2, lines 41-51).

This is followed by the writing:

"In the second step of the process, the hydrocarbon feed is catalytically partially oxidized by contact with the catalytic partial oxidation catalyst layer(s)."  
(emphasis added) (Col. 3, lines 11-13)

This is followed by an overview of the Hwang device:

"The layered catalyst member employed in the process of the present invention comprises a monolith substrate and at least one layer of a catalytic partial oxidation catalyst in contact with at least one layer of a steam reforming catalyst."  
(Col. 3, lines 31-34)

Please note Hwang's description that the gas feed can contact only one layer. The fact that Hwang's gas feed can contact only one layer is demonstrated by the enclosure of the letter "s." Applicants submit that Hwang fails to disclose a device where gas must necessarily pass through each and every one of the catalyst layers, during the passage from the inlet to the outlet.

Although the Examiner cited Hwang for its alleged disclosure of a layered catalyst that takes the form of a "graded catalyst," Applicant contends that Hwang is removed as a reference, because Hwang's alleged "graded catalyst" teaches away from the present invention. Hwang teaches away from the present invention, because the Hwang device is configured to allow transit of gas from the inlet to the outlet, without passing through all of the layers of the layered catalyst. Also, Hwang teaches away from the amended claims , because the Hwang device is configured to allow transit of gas from the inlet to the outlet, without passing through even one of the layers of the layered catalyst.

Applicants submits that the grounds for rejection of Claims 34-35 have been overcome. Withdrawal of this rejection is hereby solicited in earnest.

**Conclusion**

Applicants' current response is believed to be a complete reply to all of the outstanding issues of the latest Office Action. Accordingly, Applicants respectfully request entry of the amendments, and reconsideration and passage of the amended claims to allowance at the earliest possible convenience.

The Commissioner is hereby authorized to debit any charges or refund any overpayments to Deposit Account No. **50-2036**.

If the Examiner believes that a teleconference would aid in the prosecution of this case in any way, please call the undersigned.

Date: August 29, 2011

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